DDESB-KT 26 Mar 2002

MEMORANDUM FOR ARMY BOARD MEMBER, COLONEL PATRICK DUNKLE
NAVY BOARD MEMBER, CAPTAIN MIKE HERB
AIR FORCE BOARD MEMBER, COLONEL DANIEL TOMPKINS
MARINE CORPS BOARD MEMBER, MR. JERRY MAZZA

SUBJECT: Additional Approved Changes - 322nd Board Meeting

References: (a) 14 March 2002 E-mail to CAPT William Wright, Chairman, DDESB, from Colonel Patrick Dunkle, Chief, Munitions Division (DCS G-4), Army Board Member

(b) DDESB-KT Memorandum of 20 February 2002, Subject: 322nd Board Meeting

At the 322nd Department of Defense Explosives Safety Board (DDESB) meeting held on 20 February 2002, Action Item 1 was tabled for 30 days to allow for additional Army review and comment. Action Item 1 was the DDESB Secretariat proposal to clarify: (a) siting criteria for small quantities of Hazard Division (HD) 1.1 (< 450 lbs), (b) the use of earth-covered magazines (ECM) inhabited building distance columns for other than 7-Bar and 3-Bar ECM, and (c) the application of HD 1.1 criteria to HD 1.2.1 items under certain situations involving small quantities (< 450 lbs). At the 322nd DDESB meeting the Navy, Air Force, and Marine Corps Board Members approved the Action Item 1 change without comments, but allowed the Army Board Member the additional requested review time.

Reference (a) provides Army concurrence with Action Item 1. The approved changes associated with Action Item 1 are given in the attachment. This approved change is in addition to those that were previously approved at the 322nd DDESB meeting held on 20 February 2002 and which are documented in reference (b).

/s/William E. Wright
WILLIAM E. WRIGHT
Captain, US Navy
Chairman

Attachment
As stated

cc:
Alternate Army Board Member, Mr. J. C. King
Alternate Navy Board Member, Mr. Richard Eldridge
Alternate Air Force Board Member, Mr. Eric Olson
Alternate Marine Corps Board Member, Col Henry C. Dewey, III
JCS(J-4-SMPD)
DTRA (Gatski)
DCMA (DCMA-O)
TRANSCOM (TCJ4-LT)
DA, Director of Safety (Mr. J. Gibson)
USADAC/SOSAC-ES (Mr. Johnnie Cook)
NOSSA/N711 (Mr. Richard T. Adams

TITLE: This approval covers three topics:

(a) Clarification of Siting Criteria for Small Quantities of HD 1.1 (≤450 lbs).

(b) Clarification of the use of ECM IBD columns for other than 7-Bar and 3-Bar ECM.

(c) Application of HD 1.1 Criteria to HD 1.2.1 Items under Certain Situations Involving Small Quantities (≤450 lbs).

APPROVED CHANGES

1. **Approved changes to "OTHER PES" Columns 5 and 9 of C9.T1**: (for NEW range of 1 to 450 lbs)

	IBD	PTR
NEW	Other PES	Other PES
Col 1	Col 5	Col 9
1	See Note 3	See Note 7
2		
5		
10		
20		
30		
40		
50		
100		
150		
200		
250		
300		
350		
400		
450		

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2. **Approved Revision of C2.5.2.3.1.1:** (Replace existing C2.5.2.3.1.1 with following:)

C2.5.2.3.1.1. For all types of Hazard Division 1.1 in quantities ≤ 450 lbs NEW, the hazardous fragment distance (HFD), which equates to IBD, will be determined as follows:

C2.5.2.3.1.1.1. For Hazard Division 1.1 in a 7-Bar or a 3-Bar ECM, use "Earth-Covered Magazine" distances shown in C9.T1, as discussed in C9.3.1.1. Intraline criteria will be in accordance with C9.3.1.2.

C2.5.2.3.1.1.2. For Hazard Division 1.1 in an Undefined ECM, where the loading density [NEW (lbs)/internal magazine volume (ft^3)] is ≤ 0.028 lbs/ft^3,

use "Earth-Covered Magazine" distances shown in C9.T1, as discussed in C9.3.1.1. Intraline criteria will be in accordance with C9.3.1.2.

C2.5.2.3.1.1.3. For Hazard Division 1.1 in an Undefined ECM where the loading density is > 0.028 lbs/ft^3, use "Earth-Covered Magazine - side and rear" distances of C9.T1 and for front exposure, apply the greater of "Earth-Covered Magazine - front" IBD distance of C9.T1 or the HFD from C2.T1, for the NEW in the ECM. PTR is 60 percent of IBD or HFD, as applicable. Intraline criteria will be in accordance with C9.3.1.2.

C2.5.2.3.1.1.4. Where ECM, regardless of structural designation, have been designed, analyzed, or tested to have a reduced IBD and have been approved by the DDESB, use the approved IBD. PTR is 60 percent of IBD. Intraline criteria will be in accordance with C9.3.1.2.

C2.5.2.3.1.1.5. For Hazard Division 1.1 in a structure (excluding ECM) capable of stopping primary fragments, but which can contribute to the debris hazard, use hazardous debris and PTR distances found in C9.T6B. Intraline criteria will be in accordance with C9.3.1.2. Structures that are capable of stopping primary fragments include all heavy wall (H) and heavy wall/roof (H/R) aboveground sites (AGS), as defined in General Comment (a) of C9.T8. Doors and other openings through which primary fragments could exit must be capable of stopping primary fragments from exiting the facility or will be barricaded in accordance with C5.3 to trap primary fragments that could exit the facility.

C2.5.2.3.1.1.6. For Hazard Division 1.1 in the open or in a structure incapable of stopping primary fragments, use HFD listed in C2.T1. Intraline criteria will be in accordance with C9.3.1.2. Structures (other than ECM) that are capable of stopping primary fragments include all heavy wall (H) and heavy wall/roof (H/R) aboveground sites (AGS), as defined in General Comment (a) of C9.T8. All other structures (other than ECM) are considered incapable of stopping primary fragments. PTR is 60 percent of HFD.

C2.5.2.3.1.1.7. Selected items have been evaluated for minimum HFD with results shown in C9.T2. Other items, through testing, have been hazard classified with a specific HFD presented in the format HD (xx)1.1. The HFD for these items is specified in hundreds of feet (in parenthesis), and they may not be listed in C9.T2. The distances for these two categories of select items apply only to items in the open. When in facilities, secondary debris as well as primary fragments must be considered. If in a facility that can contain primary fragments, apply criteria of C2.5.2.3.1.1.1 through C2.5.2.3.1.1.5 above. If in a facility that cannot stop primary fragments, use the greater distance from C9.T2 (for the item being considered) or the HFD associated with the (xx)1.1 item or from C2.T1 for determining the applicable HFD. PTR is 60 percent of HFD. Intraline criteria will be in accordance with C9.3.1.2.

C2.5.2.3.1.1.8. For bare explosives in the open, distance is computed by the formula $d=40W^{1/3}$.

C2.5.2.3.1.2. For Hazard Division 1.1 NEWs in the range 451 to 30,000 lbs, HFD will be determined according to the below criteria. Public traffic route distance is 60 percent of the HFD, and intraline criteria, as applicable, will be in accordance with C9.3.1.2 or C9.3.1.3.

C2.5.2.3.1.2.1. The minimum HFD will be 1,250 ft, as shown in C9.T1. Lesser distances are permitted if supported by a structural analysis. Facilities sited at 1,235 ft or 1,245 ft per past standards will be considered to be in compliance with the 1,250 ft minimum requirement.

C2.5.2.3.1.2.2. For Hazard Division 1.1 in a 7-Bar or a 3-Bar ECM, use "Earth-Covered Magazine" distances shown in C9.T1, as discussed in C9.3.1.1.

C2.5.2.3.1.2.3. For Hazard Division 1.1 in an Undefined ECM, where the loading density is $\leq$ 0.028 lbs/ft^3, use "Earth-Covered Magazine" distances shown in C9.T1, as discussed in C9.3.1.1.

C2.5.2.3.1.2.4. For Hazard Division 1.1 in an Undefined ECM with minimum internal dimensions of 26 feet wide by 60 feet long, use "Earth-Covered Magazine - side and rear" distances of C9.T1 and "Other PES" distance of C9.T1 for the front exposure.

C2.5.2.3.1.2.5. For Hazard Division 1.1 in an Undefined ECM where the loading density is > 0.028 lbs/ft^3 and internal dimensions are less than 26 feet wide by 60 feet long, use "Other PES" distances of C9.T1 for front, side, and rear exposures.

C2.5.2.3.1.2.6. Selected items have been evaluated for minimum HFD with results shown in C9.T2. Other items, through testing, have been hazard classified with a specific HFD presented in the format HD (xx)1.1. The HFD for these items is specified in hundreds of feet (in parenthesis), and they may not be listed in C9.T2. The distances for these two categories of select items apply only to items in the open. PTR is 60 percent of HFD. When these items are placed in a facility, apply the criteria of C2.5.2.3.1.2.1 through C2.5.2.3.1.2.5 above, as appropriate.

C2.5.2.3.1.2.7. For bare explosives in the open, distance is computed by the formula $d=40W^{1/3}$.

C2.5.2.3.1.3. For Hazard Division 1.1 NEWs > 30,000 lbs, HFD will be in accordance with C9.T1. Lesser distances are permitted if supported by a structural analysis. PTR is 60 percent of HFD and intraline criteria, as applicable, will be in accordance with C9.3.1.2 or C9.3.1.3. The following apply to use of the reduced "Earth-Covered Magazine" distances shown in C9.T1, for the NEW range between 30,000 lbs and 250,000 lbs:

C2.5.2.3.1.3.1. For Hazard Division 1.1 in a 7-Bar or a 3-Bar ECM, where internal dimensions are a minimum of 26 feet wide by 60 feet long, use "Earth-Covered Magazine" distances shown in C9.T1.

C2.5.2.3.1.3.2. For Hazard Division 1.1 in a 7-Bar or a 3-Bar ECM, where internal dimensions are less than 26 feet wide by 60 feet long, use "Other PES" distances of C9.T1 for front, side, and rear exposures.

C2.5.2.3.1.3.3. For Hazard Division 1.1 in an Undefined ECM, where internal dimensions are a minimum of 26 feet wide by 60 feet long, use "Earth-Covered Magazine - side and rear" distances of C9.T1 and "Other PES" distance of C9.T1 for the front exposure.

C2.5.2.3.1.3.4. For Hazard Division 1.1 in an Undefined ECM, where internal dimensions are less than 26 feet wide by 60 feet long, use "Other PES" distances of C9.T1 for front, side, and rear exposures.

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3. **Approved Revisions to C2.T1 Notes:** (Statement added after NOTES; existing notes 4 and 5 deleted; new note 4 added)

NOTES (See C2.5.2.3.1.1 regarding application of Table C2.T1):

1. NEW < 100 Pounds: Hazardous Fragment Distance = 291.3 + [79.2 x ln(NEW)];
   NEW $\geq$ 100 Pounds: Hazardous Fragment Distance = -1133.9 + [389 x ln(NEW)];
   NEW in pounds, Hazardous Fragment Distance in feet, with a minimum distance of 236 feet; ln is natural logarithm.

2. NEW = exp [(Hazardous Fragment Distance/79.2) - 3.678]; Hazardous Fragment Distance < 658 feet;
   NEW = exp [(Hazardous Fragment Distance/389) + 2.914]; 658 feet $\leq$ Hazardous Fragment Distance < 1250 feet;
   NEW in pounds, Hazardous Fragment Distance in feet; exp [x] is e^x.

3. Use of equations given in Notes (1) and (2) to determine other Hazardous Fragment Distance-NEW combinations is allowed.

4. Public traffic route distance is 60 percent of Hazardous Fragment Distance.

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4. **Approved Revision of Note 3 of Table C9.T1**:

3. Bases for Column 5 Distances:

1-30,000 lbs- fragments and debris hazard. *Lesser distances permitted by C2.5.2.3.1 of Chapter 2.*

30,000-100,000 lbs - blast overpressure hazard. Computed by formula $d = 40W^{1/3}$.
100,000-250,000 lbs - blast overpressure hazard. Computed by formula $d = 2.42W^{0.577}$.
250,000 lbs and above - blast overpressure hazard. Computed by formula $d = 50W^{1/3}$.

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5. **Approved Revision of C9.3.1.1**:

C9.3.1.1. **Inhabited Building and Public Traffic Route Distances.** Table C9.T1 provides required separation distances to inhabited buildings and public traffic routes from ECM and other types of PESs containing HD 1.1. See paragraph C2.5.2.3.1 for application of "Earth-Covered Magazine" distances of C9.T1 to 7-Bar, 3-Bar, and Undefined ECM. Specified separations from ECM take into account reductions in blast overpressure attributable to the earth cover of the magazines. Permissible exposures at these distances are listed in subsections C2.4.3, C2.4.4, C2.4.5 and C2.4.6, Chapter 2.

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6. **Approved Revision of C9.3.2.1:**

C9.3.2.1. **GENERAL.**

C9.3.2.1.1. The HD 1.2 hazard classification is given to items configured for storage and transportation that do not mass detonate when a single item or package in a stack is initiated. Explosions involving the items result in their burning and exploding progressively with no more than a few at a time reacting. These reactions will project fragments, firebrands, and unexploded items from the explosion site. Blast effects are limited to the immediate vicinity and are not the primary hazard.

C9.3.2.1.2. Small quantities of HD 1.2.1 ($\leq$ 450 pounds NEW), in certain packaging configurations, will react in a manner more typical of an HD 1.1 event. When located in structures that stop primary fragments, but which generate a secondary debris hazard (e.g. certain ECM and hardened structures), the structural damage and debris hazards produced from these events again are more characteristic of an HD 1.1 explosion, rather than the progressive nature of an HD 1.2.1 event, as described above. When the NEW and the MCE of the packaged HD 1.2.1 items fall within the ranges specified in equation {NEW $\leq$ MCE $\leq$ 450 lbs}, the HD 1.2.1 will be treated as HD 1.1 and the criteria of C2.5.2.3.1.1.1, as applicable, will be used. If they fall outside the ranges of the equation, then the criteria of C9.T8 will be applied.

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7. **Approved Addition of New Note 6 to C9.T8:**

6. When the NEW and the MCE of the packaged HD 1.2.1 items fall within the ranges specified in equation {NEW $\leq$ MCE $\leq$ 450 lbs}, the HD 1.2.1 will be treated as HD 1.1 and the criteria of C2.5.2.3.1.1.1, as applicable, will be use (see C9.3.2.1.2).